

Immediate Effect of Graston Technique Versus PNF Stretching on Hamstring Flexibility in Undergraduate Students.

Anil Shankar Raut, St Andrews College of Physiotherapy, Pune.

Dr. Dr. Pooja Chungade (PT), Assistant Professor, St Andrews College of Physiotherapy, Pune.

Dr. Albin Jerome (PT), Principal, St Andrews College of Physiotherapy, Pune.

ABSTRACT

Background:

Hamstring tightness is frequently observed among undergraduate students, mainly due to prolonged sitting and reduced physical activity. Decreased flexibility can limit range of motion, alter posture, and increase the risk of musculoskeletal problems such as low back pain and knee dysfunction. Various therapeutic approaches, including Proprioceptive Neuromuscular Facilitation (PNF) stretching and the Graston Technique (GT), are commonly used to improve flexibility and muscle function

Objective:

To compare the immediate effects of the Graston Technique and PNF stretching on hamstring flexibility in undergraduate students.

Methodology:

A randomized controlled trial was conducted on 50 undergraduate male students aged 18–25 years. Participants were divided into two groups: Group A received PNF stretching and Group B received the Graston Technique. Hamstring flexibility was assessed using the Active Knee Extension (AKE) test before and after intervention. Both interventions were applied according to standardized protocols. Statistical analysis was performed to determine within-group and between-group differences.

Results:

Both groups demonstrated statistically significant improvement in hamstring flexibility following intervention ($p < 0.001$). However, the Graston Technique group showed a greater reduction in AKE values compared to the PNF group. The difference between the groups was statistically significant ($p < 0.05$), indicating superior effectiveness of the Graston Technique.

Conclusion:

Both PNF stretching and the Graston Technique are effective in improving hamstring flexibility immediately after treatment. However, the Graston Technique provides greater improvement and may be considered a more effective intervention for immediate results.

Keywords:

Hamstring tightness, Graston Technique, PNF stretching, flexibility, range of motion, students

INTRODUCTION

Flexibility is an essential component of physical fitness and plays a significant role in maintaining normal movement patterns, posture, and overall musculoskeletal health. A decrease in muscle flexibility can lead to tightness, which is often associated with sedentary lifestyles and insufficient physical activity. Reduced flexibility not only limits joint range of motion (ROM) but also contributes to mechanical and biochemical alterations within the musculoskeletal system [1].

The hamstring muscle group, consisting of biarticular muscles acting across the hip and knee joints, is particularly susceptible to tightness and injury. These muscles play a vital role in functional movements such as walking, running, bending, and maintaining trunk stability. Due to their anatomical and functional characteristics, hamstrings are frequently subjected to stress, making them prone to shortening and reduced extensibility [1,2].

Hamstring tightness may arise due to multiple factors, including muscle injury, prolonged immobilization, genetic predisposition, or adaptive shortening resulting from sustained postures. It can be caused by both active mechanisms, such as muscle spasm or contraction, and passive mechanisms, including postural adaptations and scar tissue formation. Regardless of the underlying cause, hamstring tightness is considered a significant contributor to various musculoskeletal conditions, particularly those affecting the knee joint and lower back [2].

Decreased hamstring flexibility has been strongly associated with postural deviations, including posterior pelvic tilt and reduced lumbar lordosis. These changes can increase the stress on the lumbar spine, leading to discomfort and low back pain. Additionally, tight hamstrings may impair movement efficiency, reduce stride length, and negatively affect both daily activities and athletic performance [3].

To address muscle tightness and improve flexibility, several therapeutic interventions are used in physiotherapy practice. Manual therapy techniques such as massage, soft tissue mobilization, and myofascial release have been shown to improve tissue extensibility by enhancing blood circulation and reducing stiffness [4,5].

Proprioceptive Neuromuscular Facilitation (PNF) stretching is a widely used technique that enhances flexibility through neuromuscular mechanisms. It involves a sequence of muscle contraction followed by relaxation, which stimulates the Golgi tendon organs. This results in autogenic inhibition, reducing muscle resistance and allowing greater stretch. Additionally, reciprocal inhibition further contributes to muscle relaxation and improved range of motion [6].

The Graston Technique (GT) is an instrument-assisted soft tissue mobilization method that focuses on identifying and treating soft tissue restrictions. It works by breaking down adhesions, stimulating fibroblast activity, and promoting collagen synthesis. These effects improve tissue mobility and enhance flexibility. GT has also been reported to increase blood flow and facilitate faster recovery of soft tissues [7,8].

Among undergraduate students, hamstring tightness is highly prevalent due to prolonged sitting during academic activities and reduced physical activity levels. This can lead to decreased flexibility, poor posture, and increased susceptibility to injuries. Although both PNF stretching and the Graston Technique are widely used, there is limited evidence comparing their immediate effectiveness in improving hamstring flexibility in this population.

Therefore, this study aims to compare the immediate effects of PNF stretching and the Graston Technique on hamstring flexibility in undergraduate students, with the objective of identifying a more effective intervention for clinical practice.

MATERIAL AND METHODOLOGY

This study was designed as a randomized controlled trial conducted over a period of six months in Pune. A total of 50 undergraduate male students aged between 18 and 25 years were included in the study. Participants were selected using a convenient sampling method.

The sample was divided into two groups of 25 participants each:

- **Group A:** Received PNF stretching
- **Group B:** Received the Graston Technique

Inclusion criteria included individuals with reduced hamstring flexibility as assessed by the Active Knee Extension (AKE) test. Participants with recent lower limb injuries, surgeries, or systemic disorders were excluded from the study.

Prior to the intervention, ethical clearance was obtained, and informed consent was taken from all participants. Baseline measurements of hamstring flexibility were recorded using the AKE test with a universal goniometer.

The intervention protocols were standardized. The PNF group underwent a hold-relax technique involving passive stretching, isometric contraction, and re-stretching cycles. The Graston Technique group received instrument-assisted soft tissue mobilization along the hamstring muscle, followed by stretching.

Post-intervention measurements were taken immediately after treatment. The collected data were analyzed using appropriate statistical tests to compare pre- and post-intervention values within and between groups.

RESULTS

The results of the present study demonstrated that both PNF stretching and the Graston Technique led to significant improvements in hamstring flexibility immediately after intervention.

Within-group analysis showed a statistically significant reduction in AKE values in both groups ($p < 0.001$), indicating improved hamstring extensibility. In the PNF group, the mean AKE values decreased from pre-intervention levels to post-intervention levels, reflecting reduced muscle tightness. Similarly, the Graston Technique group exhibited a marked reduction in AKE values following intervention.

However, when comparing between the groups, the improvement in the Graston Technique group was significantly greater than that observed in the PNF group. The mean difference in flexibility gain was higher in the Graston group, indicating superior effectiveness.

Statistical analysis using independent t-tests confirmed that the difference between the two groups was significant ($p < 0.05$). The magnitude of improvement was notably higher in the Graston group,

suggesting that instrument-assisted soft tissue mobilization produces better immediate outcomes compared to PNF stretching.

Overall, both interventions were effective, but the Graston Technique demonstrated greater clinical significance in improving hamstring flexibility.

DISCUSSION

The findings of the present study indicate that both PNF stretching and the Graston Technique are effective in improving hamstring flexibility immediately after intervention. These results are consistent with previous studies that have demonstrated the effectiveness of stretching and soft tissue mobilization techniques in enhancing flexibility [6,9].

The improvement observed in the PNF group can be attributed to neuromuscular mechanisms such as autogenic inhibition and reciprocal inhibition. During the hold-relax technique, isometric contraction activates the Golgi tendon organs, which reduces muscle tension and allows greater elongation. This leads to an increase in range of motion and decreased resistance to stretch [6].

In contrast, the Graston Technique demonstrated greater improvement in flexibility. This may be due to its direct mechanical effect on soft tissue structures. GT helps in breaking down fascial adhesions and scar tissue, thereby improving tissue mobility. Additionally, it enhances blood circulation and promotes collagen remodeling, which contributes to improved extensibility [7,10].

The microtrauma produced by the Graston instrument initiates a controlled inflammatory response, which stimulates the healing process and leads to tissue remodeling. This results in improved muscle function and reduced stiffness [10,11].

The greater effectiveness of the Graston Technique observed in this study may also be related to its combined mechanical and neurophysiological effects. While PNF primarily acts through neuromuscular pathways, GT directly targets soft tissue restrictions, providing a more comprehensive approach to improving flexibility.

Furthermore, the sedentary lifestyle of undergraduate students plays a significant role in the development of hamstring tightness. Prolonged sitting leads to adaptive shortening of muscles, which can be effectively addressed through both stretching and soft tissue mobilization techniques.

Thus, while both interventions are beneficial, the Graston Technique appears to provide superior immediate results, making it a valuable tool in clinical practice.

CONCLUSION

The present study concludes that both Proprioceptive Neuromuscular Facilitation (PNF) stretching and the Graston Technique are effective in improving hamstring flexibility immediately after intervention.

However, the Graston Technique demonstrated significantly greater improvement compared to PNF stretching. This suggests that instrument-assisted soft tissue mobilization techniques may offer enhanced benefits in terms of flexibility and muscle function.

These findings highlight the importance of selecting appropriate therapeutic interventions in physiotherapy practice. While PNF stretching remains a useful and effective method, the Graston Technique can be considered a more efficient option when immediate improvement is required.

Further studies with larger sample sizes and long-term follow-up are recommended to validate these findings.

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